ISLAND GREEN
Country Club

White Pine Partners, LP
1 Red Lion Road
Philadelphia, PA 19115

ORIGINAL

REVISED CLEANUP PLAN

Island Green Country Club

ECP Facility I.D. 1-51-0-27116

December 2002

ERG EARTHRES GROUP
ENVIRONMENTAL ENGINEERING *and* SCIENCE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF LAND RECYCLING AND WASTE MANAGEMENT

Land Recycling Program
Transmittal Sheet for Plan/Report Submission

Instructions: Please provide all requested information in each of the four sections. This transmittal sheet shall accompany any plan/report submitted to the Department under the Land Recycling Program. Proper completion of the Transmittal Sheet will assist Department review and may avoid a finding of plan/report deficiency.

Section 1 - Site Identification

Regional Identification Number 1-51-0-27116

Site Name Island Green Country Club (former Transit America, Inc.)

Site Address 1 Red Lion Road, Philadelphia, PA

Municipality and County Lower Moreland Township, Montgomery County and Philadelphia County

Section 2 - Remediation Standard. . Plan/Report. . Fees

Identify the remediation standard being pursued and the type of plan/report being submitted. Please note required Department fees follow each type of plan/report.

Check the relevant standard and circle the type of plan/report being submitted.

_____ Background Standard
Final Report ($250 fee)

_____ Site-Specific Standard

Remedial Investigation Report ($250 fee)

Risk Assessment Report
($250 fee)

(Cleanup Plan ($250 fee))

Final Report ($500 fee)

_____ Statewide Health Standard
Final Report ($250 fee)

_____ Special Industrial Area

Work Plan
(no fee)

Baseline Environmental Report
(no fee)

Ensure your check covers all required fees and is made payable to the **Commonwealth of Pennsylvania.**

Section 3 - Municipal/Public Notice Confirmation

There are two stages in the Land Recycling Program where municipal and public notices are required. Read the information associated with each stage. You will be asked to confirm that information establishing your compliance with these notification requirements has been included with this submission.

N/A Check here if you are planning to meet the Background or Statewide Health Standard and your Final Report has been submitted within 90 days of the release.

Indicate date of release here N/A

No further completion of this section is required if your Final Report for these two standards conforms to the 90 day time frame.

Stage 1 - Notice of Intent to Remediate (NIR) N/A

_____ Check here to confirm you have included proof that a copy of your NIR was provided to each municipality where your site is located. Proof will be a copy of your cover letter and a copy of a signed certified mail receipt slip from the municipality.

_____ Check here to confirm a copy of a proof of publication document from a newspaper serving the area of your site has been included with this submission.

_____ Check here to indicate that a Site-Specific Standard or a Special Industrial Area is involved and a municipal request was received for development of a public involvement plan. The plan/report submission shall include comments concerning the NIR which were submitted by the municipality and the public, and your responses to those comments.

Stage 2 - Cleanup Plan/Report Submission

November 7, 2002 Place date here that each municipality was notified of any plan or report submitted under any of the three remediation standards.

Philadelphia Daily News Place the newspaper name and date that the notice of your plan/report submission was published.

November 15, 2002

Section 4 - Project Contact

On the lines below, place the name, company, and business phone number of the individual(s) who can be contacted regarding this submission:

Scott R. Campbell, P.G. EarthRes Group, Inc. (ERG) (215) 766-1211

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF LAND RECYCLING AND WASTE MANAGEMENT

Site-Specific Standard

Site Name: Island Green Country Club (former Transit America, Inc.) **LRP ID Number:** 1-51-0-27116

Contact for Remediator: Name Jose Ramos (White Pines Partners, L.P.) **Telephone #:** (215) 677-3500

Contact for Consultant: Name Scott R. Campbell, P.G.(EarthRes Group, Inc.) **Telephone #:** (215) 766-1211

Complete				Requirements	Where in Report?	Comments#/date
Y	N	N/A				
		x	1	**NOTIFICATION**		
		x	2	**All Remediations**		
		x	3	Date Notice of Intent to Remediate submitted		previously submitted by Transit America, Inc.
		x	4	Date proof of publication in a newspaper submitted		
		x	5	Date NIR published in a newspaper		
		x	6	Date proof of NIR submission to municipality submitted		
		x	7	Date NIR submission published in *Pa. Bulletin*		DEP Input
		x	8	**Site-specific Standard and Special Industrial Area Remediations**		
		x	9	Did municipality request involvement in site remediation or reuse?		
		x	10	If yes, was a public Involvement Plan submitted?		
		x	11	Did plans or reports provide response to any public comments for site-specific standard or SIA remediation?		
		x	12	**FINAL REPORT**		previously submitted by Transit America, Inc.
		x	13	Date Final report submitted		
		x	14	Submission started 90 day review period?		
		x	15	Date submission of required fee submitted and amount		
		x	16	Date proof of publication of final report in a newspaper submitted		

* May include the rationale for why a "No" or "N/A" answer is acceptable, or a reference to a comment memorandum.

Complete Y	Complete N	Complete N/A		Requirements	Where in Report?	Comments#/date
		x	17	Date final report published in a newspaper		
		x	18	Date proof of final report submission to municipality submitted		
		x	19	Date final report submission published in *Pa. Bulletin*		DEP Input
		x	20	Date final report approved/disapproved		DEP Input
		x	21	Reason for disapproval of final report		DEP Input
		x	22	Date Department action on final report published in *Pa. Bulletin*		
		x	23	Was the final report for either a Background or Statewide health standard remediation submitted within 90 days of release?		
		x	24	If yes, what was the date of the release		
x			25	**PERSONNEL**		
		x	26	Name of ECP staff contact		
			27	Remediator's Name, address, and telephone number White Pine Partners, L.P 1 Red Lion Road Philadelphia, PA 19115 (215) 677-3500		
			28	Consultant's Name, address, and telephone number EarthRes Group, Inc. 7137 Old Easton Road Pipersville, PA 18947 (215) 766-1211		
		x	29	Other		
		x	30	**SITE CHARACTERIZATION (for all three standards)**		previously submitted by Transit America, Inc.
		x	31	**Determination of Site**		

* May include the rationale for why a "No" or "N/A" answer is acceptable, or a reference to a comment memorandum.

Complete Y	Complete N	Complete N/A		Requirements	Where in Report?	Comments#/date
		x	121	Submission fee of $250 included?		
		x	122	Proof of publication of newspaper notice included?		
		x	123	Date report submission notice published in a newspaper		
		x	124	Proof of municipality notice included?		
x			125	**Cleanup Plan**		Revised Cleanup Plan
		x	126	Cleanup plan is not required, if no exposure pathways exist.		
		x	127	Does the cleanup plan evaluate the relative abilities of the alternative remedies and propose a remedial measure that achieves the site-specific standard?		
		x	128	Does the cleanup plan include additional alternative remedies that have been requested by the Department in accordance with the Act?		
		x	129	Is the proposed remedy protective of both human and ecological receptors?		
x			130	Will use of groundwater meet the drinking water MCL and SMCL at all points of exposure?	pg 23	
		x	131	Will current drinking water or agricultural uses of groundwater, at the time contamination was discovered, be protected?		
		x	132	Does the proposed remedy meet surface water quality requirements specified in 250.406?		
		x	133	Does the proposed remedy meet air quality requirements?		
x			134	Does the cleanup plan also contain all of the following applicable information?		
x			135	Introduction	pg 5	
x			136	List of contacts	pg 7	

* May include the rationale for why a "No" or "N/A" answer is acceptable, or a reference to a comment memorandum.

Complete Y	Complete N	Complete N/A		Requirements	Where in Report?	Comments#/date
x			137	Site maps	Appendix A	
x			138	The results of treatability, bench scale or pilot scale studies or other data collected to support the remedial actions.	pg 23	
x			139	Adequate design plans and specifications sufficient to evaluate the proposed remedy.	pg 23	Appendix I
		x	140	The comments obtained as a result of a public involvement plan and the responses to those public comments. (if applicable)		
		x	141	Proposed post-remediation care requirements if needed to maintain the standard.		
		x	142	Corporation or agreement of third parties if a proposed remedy relies on access to properties owned by third parties, for remediation or monitoring.		
x			143	Signatures	pg 7	
x			144	Submission fee of $250 included?		
x			145	Proof of publication of newspaper notice included?		Appendix J
x			146	Date report submission notice published in a newspaper		November 15, 2002; Appendix J
x			147	Proof of municipality notice included?		Appendix J
		x	148	**Final Report**		previously submitted by Transit America, Inc.
		x	149	Does the report demonstrate that the remedy has been completed in accordance with the approved cleanup plan?		
		x	150	Does the drinking water use of groundwater meet the MCL and SMCL at all points of exposure?		
		x	151	Are the current drinking water or agricultural uses of groundwater, at the time contamination was discovered, being protected?		

* May include the rationale for why a "No" or "N/A" answer is acceptable, or a reference to a comment memorandum.

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Executive Summary

EarthRes Group, Inc. was contracted by White Pine Partners, L.P. to prepare a Revised Cleanup Plan for the Island Green Country Club. The Site, formerly owned and operated by Transit America, Inc., has been developed into an 18-hole golf course with supporting facilities. The Site is currently owner by White Pine Partners, L.P. During 2000, Transit America, Inc. received a Pennsylvania Land Recycling and Remediation Standards Act release of liability for groundwater and soils from the Pennsylvania Department of Environmental Protection. The release of liability for groundwater indicated groundwater would not be used at the Site for potable of agricultural purposes.

Currently, water supplied to the Site by the City of Philadelphia is used for both golf course irrigation and potable purposes. However, the objective of the Revised Cleanup Plan is to modify the existing deed notice provisions for groundwater by allowing the Site to withdraw, treat, store and use groundwater to irrigate the golf course. Pathway elimination will be maintained by treating the water prior to irrigation and by not modifying the assumptions used for the fate and transport analysis for potential receptors. Also, the Revised Cleanup Plan proposes no changes to the release of liability for soils.

On June 7, 2002, EarthRes Group, Inc. and White Pine Partners, L.P. personnel met with Pennsylvania Department of Environmental Protection officials to review the scope of work required to complete a revised Cleanup Plan. Based upon the meeting, there would be no regulatory requirement to submit a revised Notice of Intent to Remediate, Site Characterization Report, Risk Assessment Report, Final Report or Final Report Summary. However, the current Site owner would be required to submit a revised Cleanup Plan. Public notification and regulatory program review fees would be required. The existing deed notice would require revision to include the use of groundwater for irrigation purposes and, if necessary, address the installation of trenches required for the piping system in deed restricted areas. In addition, the revised Cleanup Plan must contain an Operations and Maintenance Manual for the groundwater withdrawal/treatment system.

EarthRes Group, Inc. completed the Revised Cleanup Plan to fulfill the reporting requirements of the Pennsylvania Land Recycling and Remediation Standards Act for demonstrating and maintaining attainment with a site-specific standard. The scope of work included completion of the following tasks: Contact Regulatory Agencies; Review historical reports for Site; Pumping Test and Data Analysis; Groundwater Sampling and Analysis; Review of Potential Off-Site Sources for Groundwater Impacts; and Design of Groundwater Treatment Plant.

EarthRes Group, Inc. contacted the following regulatory agencies to obtain their written assurances indicating the proposed project is in compliance with their regulations: Delaware River Basin Commission; City of Philadelphia; and, Pennsylvania Department of Environmental Protection-Bureau of Water Allocation. All regulatory agency personnel indicated that no permits or approvals were required for the project.

In order to determine the actual, sustained pumping capacity of the proposed withdrawal well and to determine the radius of influence, Pumping Well #1 was subjected to a 72-hour pumping test at the desired withdrawal rate of 70 gallons per minute. Data collected during the test was used to assess hydrogeological conditions and potential influence on the surrounding area. Water produced during the pumping test was discharged to the City of Philadelphia sanitary sewer system after receiving approval for the discharge. The pumping test occurred in a period of extreme regional drought conditions. Also, there was no rainfall during the period of the pumping test. This would suggest the results of the 72-hour pumping test completed for Pumping Well #1 are conservative and represent "worse-case conditions". Two observation wells (#1 and #2) were installed to monitor water levels during the pumping test.

The averaged results show a high average effective Transmissivity (T) of 1,718 ft^2/day or 12,853 gpd/ft. Aquifer storage coefficient values (S) averaged 0.0037. The highest T was measured in Pumping Well #1 as 2,236 ft^2/day or 16,730 gpd/ft. The highest calculated storage coefficient (S) for Observation Well #2 was measured to be 0.004. The low value indicates confined water table conditions. The low S value found in Observation Well #2 is indicative of fractured bedrock aquifers having little primary porosity. However, the fracture zone encountered by Pumping Well #1 is significant and has a high T and corresponding yield. The projected radius of influence for Pumping Well #1 is oriented in a northeast to southwest direction and extends beneath the northern edge of Red Lion Road. The current radius of influence is limited in area extent and supports the pumping test results that show a high T value and corresponding yield with minimal drawdown.

Based upon review of geologic and topographic maps for the area, there are no observed waterbodies, geologic features (i.e. dikes or faults) or other hydrologic boundary conditions that would limit the proposed discharge rate of Pumping Well #1. In addition, the pumping test data for the 72-hour test did not indicate the presence of a limited water-bearing zone. Also, since commercial and residential properties in the area are served by public water supplies and there are no production or domestic wells located in the vicinity of the site, the groundwater recharge area for Pumping Well #1 should remain protected.

Groundwater samples were collected from all three wells on August 1, 2002 and August 20, 2002; and from Pumping Well #1 on August 16, 2002 just prior to the conclusion of the pumping test. The samples obtained on August 1 and August 20, 2002 were analyzed for volatile organic compounds. The sample collected on August 16, 2002 from Pumping Well #1 was also analyzed for volatile organic compounds, including City of Philadelphia wastewater discharge parameters and the additional water quality parameters as suggested by Pennsylvania Department of Environmental Protection personnel.

Review of the laboratory analytical results shows a good comparison between the samples obtained before, during and after the pumping test. Minor variations were expected and are likely attributable to temporal effects, laboratory procedures and sample collection procedures. Although the number of volatile organic compounds detected varied between the sampling events, the primary parameters of concern remained as trichloroethene, tetrachloroethene and cis-1,2-dichloroethene. Also, there is no indication of off-site source area(s) for the found types of

To address PA DEP concerns regarding the possible presence of off-site source areas and to supplement the groundwater analytical data described in the previous section, ERG completed a database search for the area and reviewed the most recent Pennsylvania Ground Water Information System listings.

The subject Site (identified as former Transit America facility) was identified in the database report as having been listed on the Leaking Underground Storage Tanks and the VCP Voluntary Program Cleanup Sites lists. The information listed in the database identifies Heavy Metals and Solvents as the contaminants of concern and indicates the Pennsylvania Department of Environmental Protection determined no further corrective action is necessary.

Review of the information included in the database report indicates there were no plotted sites found within the search distances specified by American Society for Testing and Materials protocols for the required or supplemental Federal databases. Also, for a majority of the American Society for Testing and Materials required or supplemental State and Local databases, there were no plotted sites found. However, plotable sites were found within the underground storage tanks, leaking underground storage tank and voluntary cleanup program databases. However, due to the location of the plotted sites, the nature of the physical setting, groundwater flow direction, status of the sites and the separation distance, the likelihood of an adverse impact to the Site from the listed sites is considered low.

EarthRes Group, Inc. completed a search of the Pennsylvania Ground Water Information System database system targeting wells located hydraulically downgradient or adjacent to the Site. The data analyzed was derived from the USGS Groundwater Site Inventory database, Water Resources Division and includes information collected by the USGS, the Pennsylvania Geological Survey, and other agencies performing groundwater research projects. Based upon information provided in the Pennsylvania Ground Water Information System well database, there are no new or existing supply wells located hydraulically downgradient or adjacent to the Site.

The Site proposes to withdraw a maximum of 3 million gallons per 30-day period of groundwater at the Site, which will be treated and used for irrigation. The treatment equipment was selected based on recent data obtained for the Site from the proposed pumping well including data from the pumping test. The proposed treatment plant has been designed to meet the maximum effluent concentrations based on PA DEP Act 2 Medium Specific Concentrations for residential, used aquifers with total dissolved solids less than 2,500 mg/l.

The PW #1 pump will have the capacity to pump groundwater from the well, through the treatment equipment, and into the irrigation reservoir. Flow will be metered on the pump discharge line entering the treatment plant. Potassium permanganate will be fed to oxidize the iron and manganese into insoluble forms prior to filtration. Flow will pass through greensand filters for iron, manganese and solids removal. Following the greensand filters, groundwater will flow through the carbon adsorption unit. Granular activated carbon will remove residual volatile organic and PCB compounds present in the groundwater to below Act 2 Medium Specific Concentrations. Effluent from the adsorber will be conveyed to the irrigation reservoir via 4-inch diameter pipeline. The reservoir will be equipped with a high level sensor to stop groundwater pumping when the reservoir is full.

The discharge pipeline will be constructed from the treatment plant, along the access road and cart paths, to the reservoir. The line will be installed at a maximum depth of two (2) feet to the bottom of the trench, and will not disturb the soil in the deed restricted areas in the vicinity of the reservoir.

The groundwater treatment plant will operate when groundwater is withdrawn for irrigation purposes at the Site as long as treatment is required to meet the Act 2 Medium Specific Concentrations. The filtration prior to the carbon adsorber may be eliminated or modified if no longer warranted to extend the carbon bed life. In addition, pretreatment prior to discharge to the sanitary sewer may be modified depending on effluent quality and Philadelphia Water Department approval.

The equipment will be observed daily by site personnel to make sure the system is operating properly and to look for any operational problems, such as leaks. The primary moving parts in the groundwater treatment plant will be the pump and the valves. The permanganate supply and feed pump will be maintained as required. Filters will be backwashed as required. Sampling at the mid-point of the carbon bed will determine when the carbon will have to be replaced. At the end of the growing season, the equipment will be drained and secured for the winter.

A totalizer will be provided and readings will be taken daily by site personnel when withdrawing groundwater. Sample collection will be performed by site personnel, a contract laboratory or consultant. Groundwater withdrawal data will be submitted quarterly to the PA DEP-Bureau of Water Allocation and the Delaware River Basin Commission. Data of groundwater quality will be maintained on site. Decant water quality data will be submitted to the Philadelphia Water Department following the requirements in the sewer discharge permit.

A Post Remediation Care Plan will not be required since the numeric groundwater standards previously attained by the Site will be maintained and not altered by the removal, treatment and use of groundwater. The removed groundwater will be treated to Act 2 Medium Specific Concentrations; therefore, using the water for irrigation will complete no additional pathways. Also, the removal of groundwater by pumping will not occur if the treatment unit is not functioning as designed or if course irrigation is not required.

ERG concludes the groundwater source characterized at the Island Green Country Club will provide water of sufficient quantity without adverse impact to regional resources. Therefore, ERG recommends that no additional investigation or remedial actions are required to complete the proposed groundwater withdrawal project.

1.0 Introduction

The following sections describe the purpose, limitations and methodologies used by EarthRes Group, Inc. (ERG) to complete the following Revised Cleanup Plan for the Island Green Country Club.

1.1 Purpose

ERG is pleased to present the following Revised Cleanup Plan completed for the Island Green Country Club (Site) located in both Lower Moreland Township, Montgomery County and, Philadelphia County, Pennsylvania (see Figure 1, Appendix A). The Pennsylvania Department of Environmental Protection (PA DEP) Environmental Cleanup Program (ECP) Site Facility ID is 1-51-0-27116. The Site is owned by White Pine Partners, L.P. and has been developed into an 18-hole golf course with supporting facilities. The Site was formerly owned and operated by Transit America, Inc. and was identified as the Budd Plant.

The Site received a Pennsylvania Land Recycling and Remediation Standards Act (Act 2) release of liability for groundwater from PA DEP on March 10, 2000, March 16, 2000 and September 8, 2000. The Act 2 release of liability for soils was obtained from PA DEP on August 14, 2000. This correspondence is provided in Appendix B.

During March of 1998, a Cleanup Plan was submitted to PA DEP that indicated a "no exposure pathway" (pathway elimination) groundwater standard and establishment of numerical site-specific standards as the remedial action approach for Volatile Organic Compound (VOC) Plume Areas 1,2, 4 and 5. According to the Cleanup Plan, "the pathway elimination conditions have been demonstrated by fate and transport evaluation and by groundwater monitoring data". Since a deed notice would be filed restricting the future use of groundwater for drinking water or agricultural purposes, no remedial actions, engineering controls or Post-Remediation Care requirements were required for groundwater. PA DEP approved this Plan on May 8, 1998.

Currently, water supplied to the Site by the City of Philadelphia is used for both golf course irrigation and potable purposes. However, the objective of the Revised Cleanup Plan is to modify the existing deed notice provisions for groundwater by allowing the Site to withdraw, treat, store and use groundwater to irrigate the golf course. Pathway elimination will be maintained by treating (carbon adsorption) the water to below Act 2 Medium Specific Concentrations for organic compounds prior to irrigation and by not modifying the assumptions used for the fate and transport analysis for potential receptors. The treated groundwater will not be used to supplement or replace the potable supply. A secondary benefit of the project will be the removal and treatment of groundwater impacted by organic compounds, therefore, reducing the overall mass of contamination in the subsurface. The proposed pumping project should hasten the natural attenuation processes currently being observed at the Site. Also, this Revised Cleanup Plan proposes no changes to the Act 2 release of liability for soils.

1.2 Limitations

The findings presented herein are based on the observations and investigation described within this submittal at the time the Revised Cleanup Plan was performed. Future events at the Site or the surrounding properties and additional Site information not currently available may alter these findings.

ERG has performed this study in a professional manner using that degree of skill and care exercised for similar projects under similar conditions by reputable and competent geological consultants. Performance of Site work and report preparation has required the use of information supplied by public and private agencies. Although ERG has made an attempt to determine if the supplied information is logical and usable, ERG cannot be responsible for the accuracy of information supplied by third-party sources. There can be no assurance that Site conditions do not exist, which were undetected during the investigation that could lead to liability in connection with the Site. The conclusions provided by ERG are based solely on the scope of work conducted and on the observations described within this submittal. No other warranty, expressed or implied, is made as to the professional opinions included by ERG in this assessment.

1.3 Report Methodology

ERG completed the Revised Cleanup Plan to fulfill the reporting requirements of Act 2 for demonstrating and maintaining attainment with a site-specific standard. The scope of work included completion of the following tasks:

- Contact Regulatory Agencies;
- Pumping Test and Data Analysis;
- Groundwater Sampling and Analysis;
- Review of Potential Off-Site Sources for Groundwater Impacts;
- Design of Groundwater Treatment Plant; and
- Preparation of a Revised Cleanup Plan.

Documents reviewed during completion of this revised Report included past consultant reports, information from public sources such as the United States Geological Survey, Pennsylvania Geologic and Topographic Survey, United States Department of Agriculture, and the PA DEP Act 2 Technical Guidance Manual (revised May, 2002).

2.0 List of Contacts

The following list provides the names of the project manager(s) and personnel responsible for submission of the Revised Cleanup Plan:

Contact at White Pine Partners, L.P.:

Mr. Jose Ramos
Island Green Country Club
1 Red Lion Road
Philadelphia, PA 19115
(215) 677-3500

Contact at Island Green Country Club:

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Responsible ERG Project Managers:

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Scott R. Campbell, P.G.

Thomas G. Pullar, P.E.

3.0 Background Information

The Island Green Country Club is located at the site of the former Budd Company on Red Lion Road in Philadelphia, PA. The Budd Company manufactured aircraft during World War II, and trains and automotive parts following the end of the war. Manufacturing ceased in 1987, however, due to the past activities, soil and groundwater at the Site were contaminated.

The proposed groundwater withdrawal project area is located within what has been historically identified during the Act 2 process as "VOC Plume Area 4". VOC Plume Area 4 was located in the south-central portion of the Site; south of the Pickling Area and southwest of the former main manufacturing complex. The Pickling Area and former Tank Area D were identified as the source of the VOCs and the predominant VOCs detected in the area included: tetrachlorothene (PCE); trichloroethene (TCE); and cis-1,2-dichloroethene (cis-1,2-DCE). As determined by the Remedial Investigation and with the approval of PA DEP, VOCs were determined by Transit America, Inc. to be parameter group of concern at the Site. Both Transit America, Inc. and PA DEP did not deem the remaining elevated organic and inorganic parameters as a concern.

A groundwater extraction program was initiated during the spring/summer of 1995 by pumping of numerous recovery wells around the Site, including RO-7 in the proposed project area. The object of the groundwater extraction system was to hydraulically contain or control the groundwater plumes located beneath the Site and remove VOCs from the groundwater. Groundwater recovered by the pumping system was discharged to the City of Philadelphia sanitary sewer system. Upon receiving PA DEP-approval, the pumping of RO-7 ceased in 1998.

To complete site characterization activities using a site specific standard, the contaminants, media and potential pathways were first identified. Numerical calculations were then performed to demonstrate that pathways are not "complete" to any identified receptor(s). In order to obtain the PA DEP Act 2 release for the Site, the owner had to demonstrate that the Site conditions did not pose a risk to human health or the environment. Certain assumptions were made regarding Site conditions, including distance to receptors, future Site use and availability of public water. Final PA DEP approval was based on completion of certain cleanup tasks involving contaminated soil removal, contaminated groundwater remediation and contaminated soil remediation. In addition, the owner had to demonstrate that any remaining contamination would not impact nearby receptors, such as residents and wells, through the installation of monitoring wells at the Site and groundwater modeling.

The Site owner, Transit America, Inc. undertook the cleanup of the contamination and obtained a release of liability under the provisions of Act 2 from PA DEP in 2000. Site-specific standards were developed for groundwater since the detected compounds (chlorinated volatile organic compounds) exceeded statewide health standards at the points of compliance (property line). The cleanup efforts completed by Transit America, Inc. included the removal of approximately 1,600 tons of contaminated soil, groundwater monitoring and soil sampling, soil vapor extraction and groundwater extraction.

The site-specific groundwater standards for VOC Plume Area 4 are as follows: 1,000 parts per billion (ppb or ug/l) for PCE; 490 ug/l for TCE; and 2,100 ug/l for cis-1,2-DCE. The proposal to withdrawal groundwater at the Site and use the water for golf course irrigation would change the assumptions made during the PA DEP review process and alter the basis for receiving regulatory approval of the cleanup.

Prior to discussing the project with ERG, PA DEP regional personnel contacted the PA DEP Central Office in Harrisburg, PA for guidance on how to "re-open" an Act 2 site that previously received regulatory approval. A subsequent conference telephone call on March 5, 2002 between ERG and PA DEP personnel yielded the following information. PA DEP assumed there would be no change in the site-specific standard for groundwater and that no pathways would be completed. Therefore, PA DEP indicated there is no requirement to submit a revised Notice of Intent to Remediate (NIR), Site Characterization Report, Risk Assessment Report or Final Report.

However, the current Site owner (White Pine Partners, L.P.) would be required to submit a revised Cleanup Plan. Public notification and Act 2 program review fees would be required. Also, PA DEP personnel indicated the current deed notice prohibits the use of groundwater at the Site and restricts excavation in certain areas. Therefore, the deed notice required by the Act 2 program requires revision to include the use of groundwater for irrigation purposes and, if necessary, address the installation of trenches required for the piping system in deed restricted areas.

In addition to fulfilling all Act 2 requirements, PA DEP indicated the revised Cleanup Plan must contain an Operations and Maintenance (O&M) section for the groundwater withdrawal/treatment system. PA DEP further indicated the project would require assurances from the following regulatory agencies to demonstrate the project is in compliance with their regulations: Delaware River Basin Commission (DRBC); City of Philadelphia; and, PA DEP-Bureau of Water Allocation. PA DEP personnel indicated that additional off-site characterization activities would be required should the cone of depression for the proposed groundwater withdrawal well extend off the Site.

On June 7, 2002, ERG and White Pine Partners, L.P. personnel met with PA DEP officials at the Conshohocken, Pennsylvania offices of PA DEP to review the scope of work that was discussed during the March 5, 2002 conference telephone call. ERG presented the objectives of the 72-hour pump test, including the locations of the two (2) observation wells. Observation wells would be required since all Site monitoring wells associated with the Act 2 project were abandoned. The proposed pumping well, PW-1, was installed during October of 2001. ERG also indicated the waters generated by the pump test would be discharged to the sanitary sewer system. PA DEP recommended that in addition to analyzing for target VOCs, the pump test discharge water should be analyzed for additional parameters (i.e. hardness, iron, manganese, iron, etc.) that could potentially affect the long-term performance of the groundwater treatment unit.

4.0 Scope of Work

The following sections describe and present the results of the tasks completed by ERG to fulfill the requirements of the PA DEP and the City of Philadelphia to use groundwater for irrigation purposes at the Site.

4.1 Task 1 – Contact Regulatory Agencies

Prior to meeting with PA DEP personnel and initiating field activities, ERG contacted the following regulatory agencies to obtain their written assurances indicating the proposed project is in compliance with their regulations: DRBC; City of Philadelphia; and, PA DEP-Bureau of Water Allocation. The notification letters and responses (letters, Records of Telephone Conversations and copy of electronic mail) are included in Appendix C. DRBC and PA DEP responded by way of letter, while the City of Philadelphia (Richard Zipin) responded by electronic mail. Also, John Fabian, PA DEP-Bureau of Water Allocation, contacted ERG by telephone to discuss the project. All regulatory agency personnel indicated that no permits or approvals were required for the project. Also, at the suggestion of Mr. Zipin, ERG contacted the City of Philadelphia's Department of Licensing and Inspection-Plumbing Unit. City-personnel (Mr. McFarlane) indicated no permits were required, however, he did recommend that exposed piping and valves associated with project be labeled or tagged as "non-potable".

In addition, ERG prepared an application to the Philadelphia Water Department for approval to discharge wastewater from the proposed groundwater treatment plant to the sanitary sewer. By way of letter dated July 25, 2002, the Philadelphia Water Department granted permission to discharge into the City's sanitary sewer system the water from the 72-hour pump test and the backwash water from the proposed groundwater treatment unit (see Appendix C).

4.2 Task 2 – Pumping Test and Data Analysis

In order to determine the actual, sustained pumping capacity of the proposed withdrawal well and to determine the radius of influence (cone of depression), the proposed pumping well (PW-1) was subjected to a 72-hour pumping or "stress" test at the desired withdrawal rate of 70 gallons per minute. Data collected during the test was used to assess hydrogeological conditions and potential influence on the surrounding area. Water produced during the pumping test was discharged to the City of Philadelphia sanitary sewer system after receiving approval for the discharge. Water levels and samples were obtained from nearby observation wells (OBS-1 and OBS-2) and the pumping well before and after the pumping test and analyzed for volatile organic compounds using EPA Method 624. A water sample was obtained from PW-1 during the pumping test and analyzed for City of Philadelphia discharge parameters.

4.2.1 Borehole Placement and Construction Summary

Pumping Well #1 (PW #1) was installed by T.G. Keyes Inc. (PA Driller No. 0248) on October 2, 2001 under the supervision of a former consultant. As indicated on the Water Well Completion Report submitted to the Pennsylvania Department of Conservation and

Natural Resources, the borehole was completed as an 8-inch diameter open borehole to a total depth of 160-feet below the ground surface (bgs). PW #1 was constructed with 38-feet of 8-inch diameter steel casing set in a 10-inch diameter hole and grouted in place. The driller noted water-bearing zones at 44-feet (approximately 60 gallons per minute), 54-feet (approximately 30 gallons per minute) and 85-feet (approximately 10 gallons per minute). The observed lithologies are listed in the completion report, which can be found in Appendix D. The location of PW #1 is shown on Figure 2 in Appendix A.

On July 9, 2002, T.G. Keyes, Inc. installed two observation wells (OBS #1 and OBS #2) for the purposes of monitoring groundwater elevations and obtaining groundwater samples. The locations of each is well is depicted on Figure 2. Based upon review of historical reports for the Site, the cone of influence for former recovery well RO-7 was oriented in northeast to southwest direction, similar to regional geologic features. RO-7 was later abandoned by grouting. PW #1 is located approximately in the same position formerly occupied by RO-7. The historical groundwater flow direction for the Site is toward the south. Therefore, OBS #1 was installed to the north of PW #1, perpendicular to groundwater flow and the orientation of the former cone of influence while OBS #2 was located west of PW #1, parallel to groundwater flow and along the axis of orientation of the former cone of depression. OBS #2 was also sited near the western property boundary to determine the off-site influences of PW #1.

OBS #1 was completed as a 6-inch diameter open borehole to a depth of 123-feet bgs. OBS #1 was completed with 61.5-feet of 6-inch diameter steel casing seated into bedrock, including 2.5-feet of stickup. OBS #2 was drilled as a 6-inch diameter borehole to a depth of 122-feet bgs. OBS #2 was completed with 53-feet of 6-inch diameter steel casing seated into bedrock including 3-feet of stickup. Both wells were drilled as 8-inch diameter boreholes into competent bedrock with the steel casings then grouted in place. ERG personnel were present to observe well installation activities. Well construction diagrams are provided in Appendix D. Published geologic information (Pennsylvania Series – Map 61 – Frankford Quadrangle) identifies the underlying bedrock as oligoclase-mica schist of the Wissahickon Formation. Conditions observed during observation well installation is in agreement with published information for the Site and area.

Large, water-bearing fractures were not encountered during the drilling of the observation wells on July 9, 2002. A small amount of water was observed at the bedrock interface and weathered overburden, however steel casing was set into competent rock to reduce any direct influence from shallow water bearing zones or surface water. Well yields of less than 2 gallons per minute (gpm) were observed for both observation wells. The driller developed each observation well for approximately 30 minutes. A measurable change in water level in PW #1 was not observed during the installation of the observation wells.

4.2.2 PW #1-Short Term Capacity Test

On August 5, 2002, T.G. Keyes, Inc. installed a 5-horsepower electric submersible pump in PW #1. The pump was suspended in the borehole at approximately 140-feet bgs and was fitted with a 3-inch diameter steel discharge pipe, control valve and totalizing flow meter. The discharge pipe was connected to a Philadelphia Water Department sanitary sewer

manhole via a 6-inch diameter PVC pipe. A permit for this discharge was obtained from the City of Philadelphia Water Department prior to pump installation. Power was supplied to the pump from the nearby maintenance building through a capacitor control box.

Water levels in the borehole were monitored during the test using a hand-operated water level meter. Well flow was adjusted with a ball valve and monitored using a metered flow-measuring device. The short-term capacity test was conducted to estimate the optimum sustainable yield of the well and check the integrity of the discharge plumbing. The test commenced on August 8, 2002 at approximately 9:30 am. The flow rate during the test was increased in two intervals in an attempt to gauge the sustainable yield. Additional intervals of increased flow were not run due to electrical problems encountered at the beginning of the test.

The test indicated that water level decrease in PW #1 was approximately 8-feet at a pumping rate of 60 gpm and 10-feet at a pumping rate of 75 gpm. Based upon well drawdown, a constant rate pump test was planned with a predicted pumping rate of 70 gpm.

4.2.3 PW #1-72 Hour Pumping Test

The constant rate pumping test commenced on August 13, 2002 at 7:10 a.m. The target flow rate for the test was 70 gpm. During the actual performance of the 72-hour test, the flow rate was routinely monitored and adjusted by ERG personnel. An average flow rate of approximately 70 gpm was calculated for the test from the presented data.

4.2.3.1 Pumping & Observation Well Data Recording

Three (3) observation points; PW #1, OBS #1 and OBS #2 were monitored for the pumping test. These points were monitored using electronic pressure transducers and a data logger. The equipment used for electronic data recording consisted of an In-Situ, Inc. Hermit 3000 data logger and three (3) In-Situ, Inc. PXD-261 pressure transducers rated at 100 pounds per square inch (230-feet of head). Observation point locations are shown on Figure 2.

The electronic data logger and pressure transducers were installed in the wells on August 12, 2002. The pressure transducers were placed approximately 10-feet from the bottom of each observation well and approximately 5-feet above the pump in PW #1. The pressure transducer cable was attached securely to each wellhead to prevent the transducers from moving during the tests. The transducers were cabled to the Hermit 3000 data logger and attached securely to the weatherproof case.

Approximately 16-hours of background water level data was collected prior to initiating the 72-hour pumping test. The data logger started collecting water level measurements in 10-minute intervals at 3:13 p.m. on August 12, 2002. A total of 96 water level readings were taken for each observation point and data collection ceased at 7:06 a.m. on August 13, 2002. The water level in PW #1 remained constant during the collection of the background data. The water level in OBS #1

decreased approximately 0.2-feet, while the water level in OBS #2 increased approximately 0.3-feet during the collection of background data.

Water level measurements were taken on a regular schedule during the 72-hour pumping test in the monitoring points listed above. The data logger and pressure transducers were programmed to record water levels at a log-cycle interval for the first 10-minutes of the pump test and thereafter, at 10-minute intervals. Collection of electronic water level readings in the observation wells and pumping well commenced at the beginning of the test on August 13, 2002 at 7:10 a.m. During the 72-hour pumping test, the data from the data logger was periodically downloaded to a laptop computer to ensure data storage and security.

4.2.3.2 Test Conclusion and Recovery Testing

On August 16, 2002 at 7:10 a.m., the pump was turned off after 72-hours of constant rate pumping and the recovery period began. Just prior to the end of the test, water quality samples were collected to fulfill the requirements of the City of Philadelphia Water Department. The water quality sampling is further discussed in Section 4.3.

At the completion of the pumping portion of the test, the data logger was downloaded to a laptop computer and the recording interval program immediately re-started for recovery test data acquisition. The recovery period was lasted for approximately three hours and thirty minutes.

4.2.3.3 Pumping Test Data Analysis Methods and Results

The following pumping test analysis methods were applied to the data. Data graphs showing the use of each method are provided in Appendix E.

A. Cooper-Jacob Method

The pumping portion of the constant rate test was analyzed with the Cooper-Jacob (1946) Straight Line Method. Conditions assumed when applying this method are as follows: fully penetrating pumping well; constant pumping rate; flow is in the range of Darcy's law; water is discharged instantaneously from storage; and the aquifer is homogeneous and isotropic, with a constant thickness, negligible slope, and is of infinite extent. The Cooper-Jacob method involves plotting values of draw down (s) against the logarithms of time (t) after pumping started on semi-logarithmic paper. The time-draw down field will yield a straight-line graph in the region where $r^2S/4Tt$ (or u) ≤ 0.01. A straight line is fitted through the aligned points and is extended to intersect the zero-draw down axis. The slope of the straight line is used in part to determine the transmissivity and the zero-draw down intercept is used in part to determine the coefficient of storage.

The results of the constant rate pumping and recovery test at PW #1, using the methods described in Section 4.2.3.3, are presented in Table 1 in Appendix E. OBS #2 had a discernible drawdown during the pump test and was used for the analysis. OBS #1 had minimal drawdown (actual numbers) most likely due to the lack of efficient connection to the bedrock aquifer, and was therefore not used for parameter averaging.

The averaged results show a high average effective Transmissivity (T) of 1,718 ft^2/day or 12,853 gpd/ft. Aquifer storage coefficient values (S) averaged 0.0037. The highest T was measured in PW #1 as 2,236 ft^2/day or 16,730 gpd/ft. The highest calculated storage coefficient (S) for OBS #2 was measured to be 0.004. The low value indicates confined water table conditions. The low S value found in OBS #2 is indicative of fractured bedrock aquifers having little primary porosity. However, the fracture zone encountered by PW #1 is significant and has a high T and corresponding yield.

The projected radius of influence for PW #1 at 70 gpm is shown graphically on Figure 3 and by plan view on Figure 4. Both Figures are located in Appendix A. The radius of influence is oriented in a northeast to southwest direction and extends beneath the northern edge of Red Lion Road. The radius of influence for PW #1 is similar to the radius of influence formerly exhibited by Recovery Well RO-7. The current radius of influence is limited in areal extent and supports the pumping test results that show a high T value and corresponding yield with minimal drawdown.

A 72-hour pumping or "stress" test is designed to reveal hydrologic boundaries or the presence of limited water bearing zone(s). Based upon review of geologic and topographic maps for the area, there are no observed waterbodies, geologic features (i.e. dikes or faults) or other hydrologic boundary conditions that would limit the proposed discharge rate of Pumping Well #1. In addition, the pumping test data for the 72-hour test did not indicate the presence of a limited water-bearing zone. Also, since commercial and residential properties in the area are served by public water supplies and there are no production or domestic wells located in the vicinity of the site, the groundwater recharge area for Pumping Well #1 should remain protected.

4.3 Task 3 - Groundwater Sampling and Analysis

Groundwater samples were collected from all three (3) wells on August 1, 2002 and August 20, 2002; and from PW #1 on August 16, 2002 just prior to the conclusion of the pumping test. The samples obtained on August 1 and August 20, 2002 were analyzed by QC, Inc. (PADER Lab No. 09-131) for VOCs using EPA Method 624. The sample collected on August 16, 2002 from PW #1 was also analyzed by QC, Inc. for VOCs using EPA Method 624, including City of Philadelphia wastewater discharge parameters and the additional water quality parameters as suggested by PA DEP personnel.

The August 1 and August 20, 2002 samples were obtained to compare pre-pumping laboratory analytical to post-pumping laboratory analytical data and to identify potential off-site sources of

groundwater contaminants. The August 16, 2002 sample was obtained from PW #1 to evaluate groundwater quality after pumping the well for an extended period of time (72-hours) and rate (70 gpm). The Groundwater Flow Direction Maps for August 1 and August 20, 2002 are presented as Figures 5 and 6 in Appendix A. Both maps show a general flow direction toward the south or east; generally mimicking local topography.

Table 1 in Appendix F, shows the wells that exhibited laboratory detections and compares the results to applicable Act 2 Medium Specific Concentrations (MSCs) for groundwater at residential sites. The results in Table 2 will be discussed in the following sections by individual well. The laboratory certificates of analysis for the groundwater samples are provided in Appendix G. The summarized VOC detections for the samples obtained on August 1 and August 20, 2002 are shown on Figures 7 and 8 in Appendix A. The summarized laboratory analytical results for August 16, 2002 are shown on Figure 9 in Appendix A.

OBS #1

The sample obtained on August 1, 2002 exhibited the following detections and concentrations: 1,1-dichloroethane (0.540 J ug/l); TCE (36.9 ug/l); PCE (4.4 ug/l); and cis-1,2-DCE (5.54 ug/l). The sample obtained on August 20, 2002 exhibited the following detections and concentrations: methylene chloride (4.15 J ug/l); chloroform (1.44 ug/l); TCE (31.7 ug/l); toluene (0.64 J ug/l); PCE (3.46 ug/l); and cis-1,2-DCE (2.58 ug/l). A laboratory "J" indicates a value that is greater than the laboratory Minimum Detection Limit (MDL), however lower than the lowest standard used for calibration.

Both the August 1 and August 20, 2002 samples showed concentrations of TCE above the applicable Act 2 MSC of 5 ug/l; however, the detected concentrations were below the VOC Plume Area 4 site-specific standard of 490 ug/l. As discussed in Section 3.0, the site-specific groundwater standards are as follows: 1,060 ug/l for PCE; 490 ug/l for TCE; and 2,100 ug/l for cis-1,2-DCE.

OBS #2

The sample obtained on August 1, 2002 exhibited the following detections and concentrations: vinyl chloride (1.31 J ug/l); TCE (39.8 ug/l); 1,2-dichloropropane (0.41 J ug/l); PCE (78.7 ug/l); chlorobenzene (0.43 J ug/l); 1,3-dichlorobenzene (0.47 J ug/l); 1,2,4-trichlorobenzene (3.32 J ug/l); 1,2,3-trichlorobenzene (3.73 J ug/l); and cis-1,2-DCE (114 ug/l).

The sample obtained on August 20, 2002 exhibited the following detections and concentrations: vinyl chloride (2.4 J ug/l); acetone (4.39 J ug/l); TCE (23.2 ug/l); 1,2-dichloropropane (0.56 J ug/l); toluene (1.94 J ug/l); PCE (52.5 ug/l); 1,3-dichlorobenzene (0.45 J ug/l); 1,2,4-trichlorobenzene (3.26 J ug/l); 1,2,3-trichlorobenzene (3.38 J ug/l); and cis-1,2-DCE (89.5 ug/l).

Both the August 1 and August 20, 2002 samples showed concentrations of TCE, PCE and cis-1,2-DCE above the applicable Act 2 MSCs for each compound (5 ug/l for TCE, 5 ug/l for PCE and 70 ug/l for cis-1,2-DCE); however, the detected concentrations were below the VOC Plume Area 4 site-specific standards of 490 ug/l, 1,060 ug/l and 2,100 ug/l respectively.

PW #1

The sample obtained on August 1, 2002 exhibited the following detections and concentrations: TCE (12.5 ug/l); PCE (48.2 ug/l); 1,3-dichlorobenzene (1.45 J ug/l); 1,2,3-trichlorobenzene (3.41 J ug/l); and cis-1,2-DCE (86.9 ug/l). The sample obtained on August 20, 2002 exhibited the following detections and concentrations: TCE (14.3 ug/l); acetone (9.69 ug/l); toluene (1.35 J ug/l); PCE (34.8 ug/l); 1,2,4-trichlorobenzene (1.6 J ug/l); 1,2,3-trichlorobenzene (1.62 J ug/l); and cis-1,2-DCE (55.3 ug/l).

The sample obtained on August 16, 2002 exhibited the following detections and concentrations: barium (42.8 ug/l); calcium (15,600 ug/l); calcium hardness (39,000 ug/l); iron (179 ug/l); magnesium (8,520 ug/l); magnesium hardness (35,000 ug/l); manganese (83.2 ug/l); total hardness (74,000 ug/l); zinc (105 ug/l); 1,2,4-trichlorobenzene (4.68 J ug/l); aroclor-1242 (2.03 ug/l); TCE (16.2 ug/l); PCE (56.6 ug/l); 1,3-dichlorobenzene (0.71 J ug/l); 1,2,3-trichlorobenzene (3.57 J ug/l); 1,4-dichlorobenzene (0.51 J ug/l); and cis-1,2-DCE (59.1).

Although not directly comparable to Act 2 MSCs for dissolved metals, the laboratory results for the total metals were not elevated in comparison to Act 2 MSCs for dissolved metals. Laboratory analytical results for total metals can be unduly influenced by the particulate matter (sediment) in the sample, and are generally more elevated than the laboratory results for dissolved metals. Also, manganese was quantified at 83.2 ug/l, slightly above the Act 2 secondary MSC of 50 ug/l. Secondary MSCs such as iron and manganese are used to judge the aesthetic quality of the water.

The August 1, August 16 and August 20, 2002 samples showed concentrations of TCE and PCE above the applicable Act 2 MSC of 5 ug/l for each compound; however, the detected concentrations were below the VOC Plume Area 4 site-specific standards of 490 ug/l and 1,060 ug/l, respectively. Also, the August 1, 2002 sample showed a concentration of cis-1,2-DCE above the applicable MSC of 70 ug/l. However, this result was below the VOC Plume Area 4 site-specific standard of 2,100 ug/l.

4.3.1 Discussion of Results

Review of the previously described laboratory analytical results for VOCs shows a good comparison between the samples obtained before, during and after the pumping test. Minor variations were expected by ERG and are likely attributable to temporal effects, laboratory procedures and sample collection procedures. Although the number of VOCs detected varied between the sampling events, the primary parameters of concern remained as TCE, PCE and cis-1,2-DCE. Other minor compounds detected by laboratory were generally qualified as "J" values or are daughter products of the VOCs found on-site.

Also, the parameters detected, including arochlor-1242 and acetone, have been historically detected in soil and/or groundwater this portion of the site (VOC Plume Area #4). Also, based upon ERG's review of the data, there is no indication of off-site source area(s) for the found types of parameters. In the future to verify groundwater quality, groundwater samples will be obtained annually from PW #1 and analyzed for VOCs (see Section 5.3.3)

5.0 Groundwater Treatment Equipment

The Site received an Act 2 release of liability for groundwater from PA DEP on March 10, 2000, March 16, 2000 and September 8, 2000. The release was based on no groundwater use at the site for drinking or agricultural purposes.

Water is supplied to the Site by the City of Philadelphia for drinking and agricultural (i.e., golf course irrigation) purposes. The Revised Cleanup Plan proposes to modify the existing restrictions on groundwater use by allowing the Site to withdraw, treat, store and use groundwater to irrigate the golf course. Treated groundwater will not be used for drinking water purposes at the Site. The following section describes the equipment proposed to treat the groundwater withdrawn from the Site to render it suitable for irrigation at the Island Green Country Club.

5.1 Design Parameters

Island Green proposes to withdraw a maximum of 3 million gallons per 30-day period of groundwater at the Site, which will be treated and used for irrigation. The treatment equipment was selected based on recent data obtained for the Site from the proposed pumping well (see Table 2 in Appendix F), including data from the pumping test. The proposed treatment plant has been designed to meet the maximum effluent concentrations shown in Table 2. Maximum effluent concentrations are based on PA DEP Act 2 Medium Specific Concentrations (MSCs) for residential, used aquifers with total dissolved solids less than 2,500 mg/l.

5.2 Groundwater Treatment Plant Design

The proposed groundwater treatment plant will be located adjacent to the maintenance garage (see Figure 10). The process schematic of the treatment unit is shown in Figure 11. The specific equipment described below may be changed depending on conditions encountered in the field. Design calculations and the proposed equipment are located in Appendix I.

5.2.1 Groundwater Treatment

A Grundfos submersible pump, Model 85S100-10 hp or equal, will be installed in PW #1. The pump will have the capacity to pump 100-gpm of groundwater from the well at 300' TDH, through the treatment equipment, and into the irrigation reservoir. Flow will be metered on the pump discharge line entering the treatment plant.

Flow will pass through greensand filters, four (4) 30" diameter by 72" high units, for iron, manganese and solids removal. Potassium permanganate will be fed into the filter influent to oxidize the iron and manganese present in the groundwater and convert both into insoluble forms for removal on the filter media. The filters will remove iron, the preciptated manganese and other solids present in the groundwater, improving groundwater aesthetics and extending carbon bed life. Approximately 1.2 pounds per day of solids will be removed from the groundwater at current loading rates.

Following the greensand filters, groundwater will flow through the carbon adsorption unit.

Granular activated carbon will remove residual volatile organic and PCB compounds present in the groundwater to below Act 2 MSCs. The carbon will be contained in a 72" diameter, 144" high vessel, holding 5,000 pounds of carbon. The limiting constituent is cis-1,2-dichloroethene (cis-1,2-DCE) for carbon usage. Based on projected flow rates and current cis-1,2-DCE concentrations, carbon usage is estimated to be 1,000 pounds per month. The 5,000-pound adsorber will last approximately 5 month before exhaustion of the carbon.

Effluent from the adsorber will be conveyed to the irrigation reservoir via 4-inch diameter pipeline. The reservoir will be equipped with a high level sensor to stop groundwater pumping when the reservoir is full. The discharge pipeline will be constructed from the treatment plant, along the access road and cart paths, to the reservoir. The line will be installed at a maximum depth of two (2) feet to the bottom of the trench, and will not disturb the soil in the deed restricted areas in the vicinity of the reservoir. Any exposed piping will be labeled or tagged as "non-potable".

5.2.2 Byproduct Management

The greensand filters will be backwashed when needed based on pressure drop across the filter media. Influent flow will be reversed through the filters to backwash the filters and remove accumulated solids. Based on preliminary calculations using water quality, each filter will be backwashed for 20 minutes at 50-gpm, generating approximately 1,000 gallons of water per filter every 3 days.

Backwash water will be diverted into a decant tank, a 64" diameter by 156" high tank with a 2,000 gallon capacity, for storage. In the tank, the solids will settle and accumulate in the tank bottom and clear water will remain at the top of the tank. Clear water in the decant tank will be discharged through a carbon drum for removal of residual organic material prior to discharge to the sanitary sewer under the provisions of the Philadelphia Water Department permit obtained for the Site (letter in Appendix C). A 375-pound carbon drum will last approximately 3 years before replacement.

Solids accumulated in the decant tank will be removed as needed for disposal. The 2,000-gallon tank provides storage for one backwash (1,000 gal) plus 3 months of solids accumulation (900 gal). Disposal requirements will be determined based on actual analysis of the solids; however, off-site disposal will be provided initially. Based on a generation rate of 1.2 pounds per day of solids and a 1% solids concentration, 2,400 gallons per year of solids will require disposal.

Carbon removal and replacement in the adsorber vessel will be performed in bulk by a carbon vendor. The spent carbon will be removed and replaced by regenerated carbon. Spent carbon will be regenerated at an off-site facility. Carbon is provided for removal of organic compounds in the groundwater without the need for air emissions from a stripping tower or similar technology.

5.3 Operation, Maintenance and Monitoring

5.3.1 Operation

The groundwater treatment plant will operate whenever groundwater is withdrawn for irrigation purposes at the Site as long as treatment is required to meet the Act 2 MSCs. The filtration prior to the carbon adsorber may be eliminated or modified if no longer warranted to extend the carbon bed life. In addition, pretreatment prior to discharge to the sanitary sewer may be modified depending on effluent quality and Philadelphia Water Department approval.

The groundwater pump is designed to convey flow from the well, through the filters, through the carbon adsorber and to the irrigation reservoir. Groundwater will be used to backwash the filters. The permanganate supply and feed pump will be checked for proper operation. Backwash frequency will be determined by the pressure drop across the filters, and has been assumed to be every 72 hours for design purposes. Carbon bed life will be 5 months with cis-1,2-DCE being the limiting parameter.

The equipment will be observed daily by site personnel to ensure the system is operating properly and to look for any operational problems, such as leaks. Filter backwash will initiate automatically and the backwash water will be sent to the decant tank for storage. Manual backwash will be possible if needed. Accumulated water will be discharged from the decant tank through the carbon adsorber drum to the sanitary sewer by the operator following completion of the backwash cycle. It is anticipated that the backwashed decant cycle will take place daily with four filters in operation. This will allow several hours for the solids to settle in the tank. The operator will also observe and record the amount of solids that have accumulated in the decant tank. When the solids occupy more than half of the tank volume, a contractor will be called to remove the solids to off-site disposal. Solids removal is anticipated to be required two times per year.

5.3.2 Maintenance

The primary moving parts in the groundwater treatment plant will be the pump and the valves. Filters will be backwashed as required. The media will be changed if required depending on actual pollutant and iron loading removal effectiveness. The permanganate feed will extend greensand filter media life.

Potassium permanganate will be replenished as required. The metering pump will be adjusted and maintained to keep the desired feed rate. Based on current groundwater quality, approximately one pound per day of permanganate will be required and a ten day supply will be maintained on-site.

Sampling at the mid-point of the carbon bed will determine when the carbon will have to be replaced. Carbon replacement will be in bulk by a carbon vendor.

At the end of the growing season, the treatment equipment and discharge pipeline will be drained and secured for the winter.

5.3.3 Monitoring

The following monitoring program is proposed for the groundwater withdrawal and treatment facilities at the Island Green Country Club. Flow from the well will be measured continuously on the discharge line from the well. A totalizer will be provided and readings will be taken daily by Site personnel when withdrawing groundwater.

Water sampling and analysis will be performed to monitor influent quality, effluent quality and equipment performance. Limited on-site analysis will be performed by Island Green personnel for parameters such as pH and iron for internal process monitoring purposes only. Sample collection will be performed by site personnel, a contract laboratory or consultant. All analysis of samples collected for reporting purposes of influent and effluent quality will be performed by a PA DEP-certified laboratory. Samples will be taken from the following locations for analysis of the parameters listed:

GWTP MONITORING SCHEDULE			
Location	**Parameters**	**Test Method**	**Frequency**
PW-1	Depth to water	Measured	Weekly
Untreated Groundwater	Flow Metals: Barium Iron Manganese Zinc Wet Chemistry: TSS pH VOC PCB	Measured EPA 600 Method 200.7 Std. Method 2540D EPA 600 Method 150.7 EPA Method 8260B EPA Method 608	Daily when operating Annually
Mid-point Carbon	VOC PCB	EPA Method 8260B EPA Method 608	Bi-monthly
Effluent	VOC PCB	EPA Method 8260B EPA Method 608	Twice per season
Decant water	Metals VOC PCB BN, AE BOD-5 TSS pH NH3-N CN O&G (HEM)	EPA 600 Method 200.7 EPA Method 8260B EPA Method 608 EPA Method 625 Std. Methods 5210B Std. Methods 2540D EPA 600 Method 150.1 Std. Methods 4500 Std. Methods 4500C Std. Methods 1664A	Annually

Groundwater withdrawal data will be submitted quarterly to the PA DEP-Bureau of Water Allocation and the DRBC. Data of groundwater quality will be maintained on site. Decant water quality data will be submitted to the Philadelphia Water Department following the requirements in the sewer discharge permit.

11.0 Conclusions and Recommendations

Water is supplied to the Site by the City of Philadelphia is used for drinking and agricultural purposes. The Revised Cleanup Plan proposes to modify the existing restrictions (see Appendix K) on groundwater use by allowing the Site to withdraw, treat, store and use groundwater to irrigate the golf course. Treated groundwater will not be used for drinking water purposes at the Site. The proposed deed notice for revised deed restrictions is included in Appendix L. The discharge pipeline will be constructed from the treatment plant, along the access road and cart paths, to the reservoir. The line will be installed at a maximum depth of two (2) feet to the bottom of the trench, and will not disturb the soil in the deed restricted areas in the vicinity of the reservoir. Therefore, no deed revisions are required for soil.

ERG concludes the groundwater source characterized at the Island Green Country Club will provide water of sufficient quantity without adverse impact to regional resources. The removed groundwater will be treated to Act 2 MSCs; therefore, using the water for irrigation will complete no additional pathways. Also, the removal of groundwater by pumping will not occur if the treatment unit is not functioning as designed or if course irrigation is not required. In addition, the proposed groundwater withdrawal project is consistent with the past Act 2 approvals for the Site. Therefore, ERG recommends that no additional investigation or remedial actions are required to complete the proposed groundwater withdrawal project.

SOURCE: USGS 7.5 MINUTE QUADRANGLE – FRANKFORD, PA

ENVIRONMENTAL ENGINEERING *and* SCIENCE

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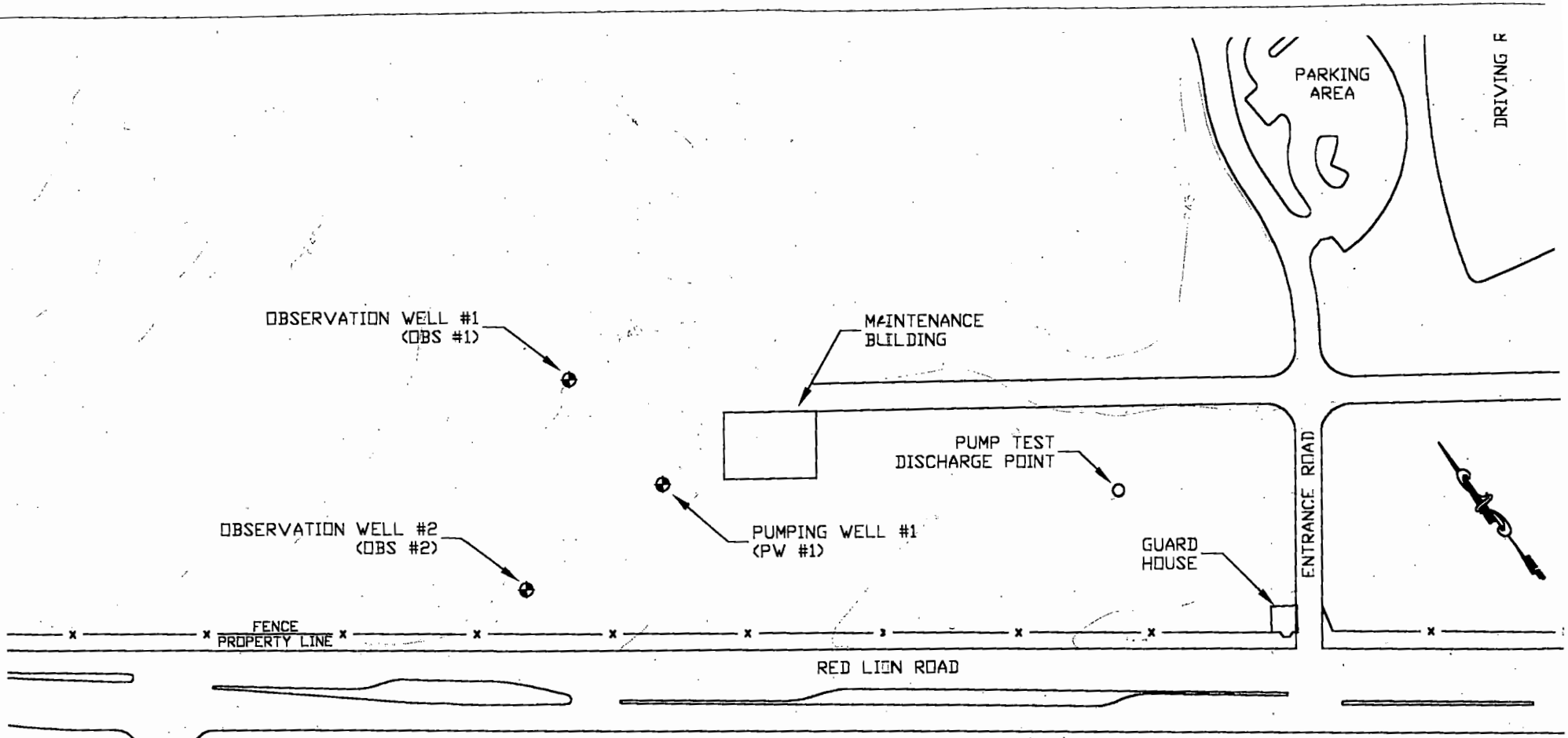
DRAWN BY: AJC	CHECKED BY: SRC
DATE: [illegible]	PROJECT NO: [illegible]
DRAWING SCALE: 1" = 2000'	

FIGURE 1

SITE LOCATION MAP

ISLAND GREEN COUNTRY CLUB
1 RED LION ROAD
PHILADELPHIA, PENNSYLVANIA



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OCATIONS ARE APPROXIMATE)

'PROX. COUNTY LINE

'POGRAPHIC CONTOUR

N: "GENERAL GOLF COURSE / SITE TOPO PLAN"
ITE ASSOCIATES, 11/7/00.

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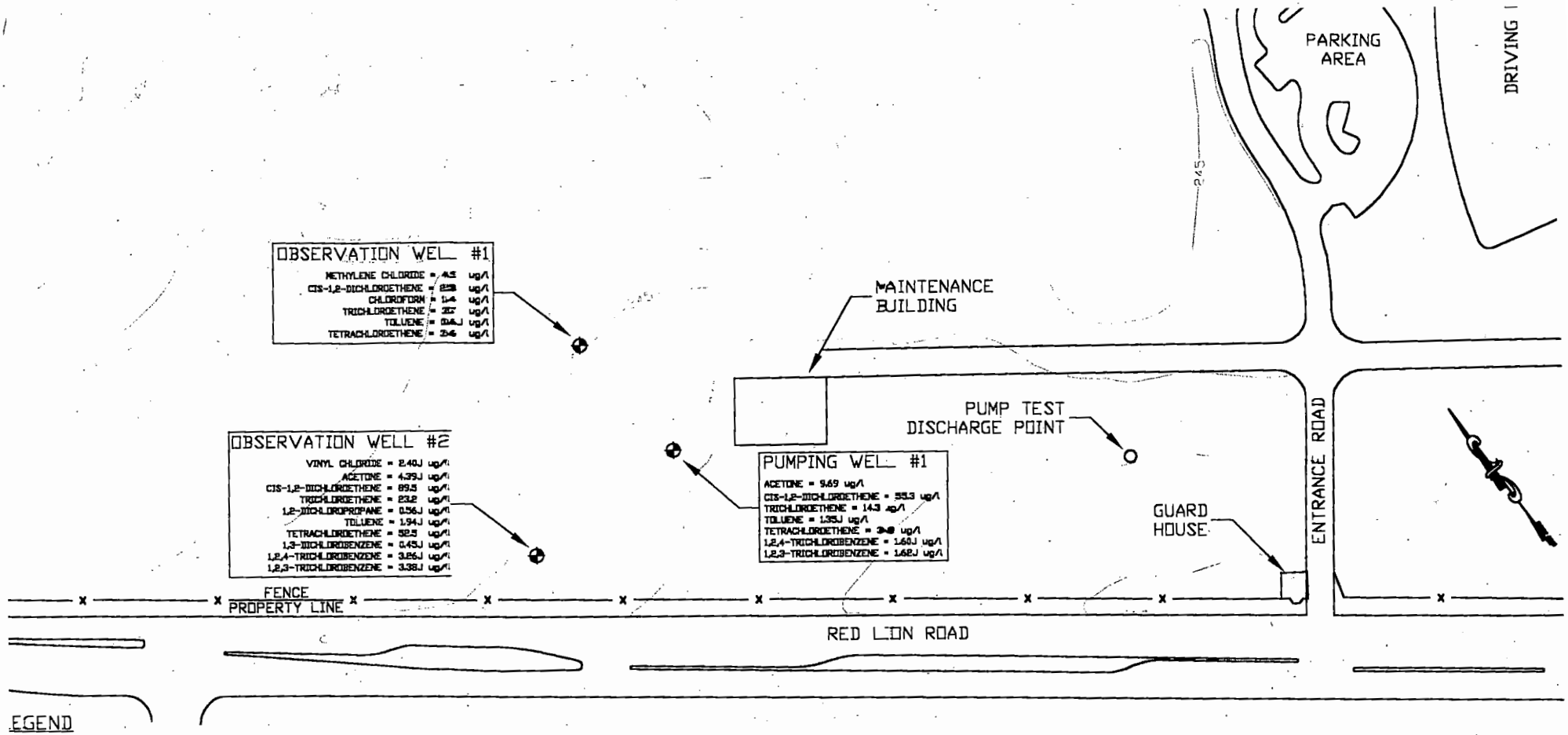
AJG	SRC
DATE: 11/25/02	PROJECT NO: 021015.001
DRAWING SCALE: 1" = 100'	

FIGURE 2
WELL NETWORK

ISLAND GREEN COUNTRY CLUB
1 RED LION ROAD
PHILADELPHIA, PENNSYLVANIA



EGEND

/ELL LOCATION (ANALYTICAL RESULTS)
_OCATIONS ARE APPROXIMATE)

PPROX. COUNTY LINE

OPOGRAPHIC CONTOUR

FROM "GENERAL GOLF COURSE / SITE TOPO PLAN"
DWITCH ASSOCIATES, 11/7/00.

ENVIRONMENTAL ENGINEERING *and* SCIENCE

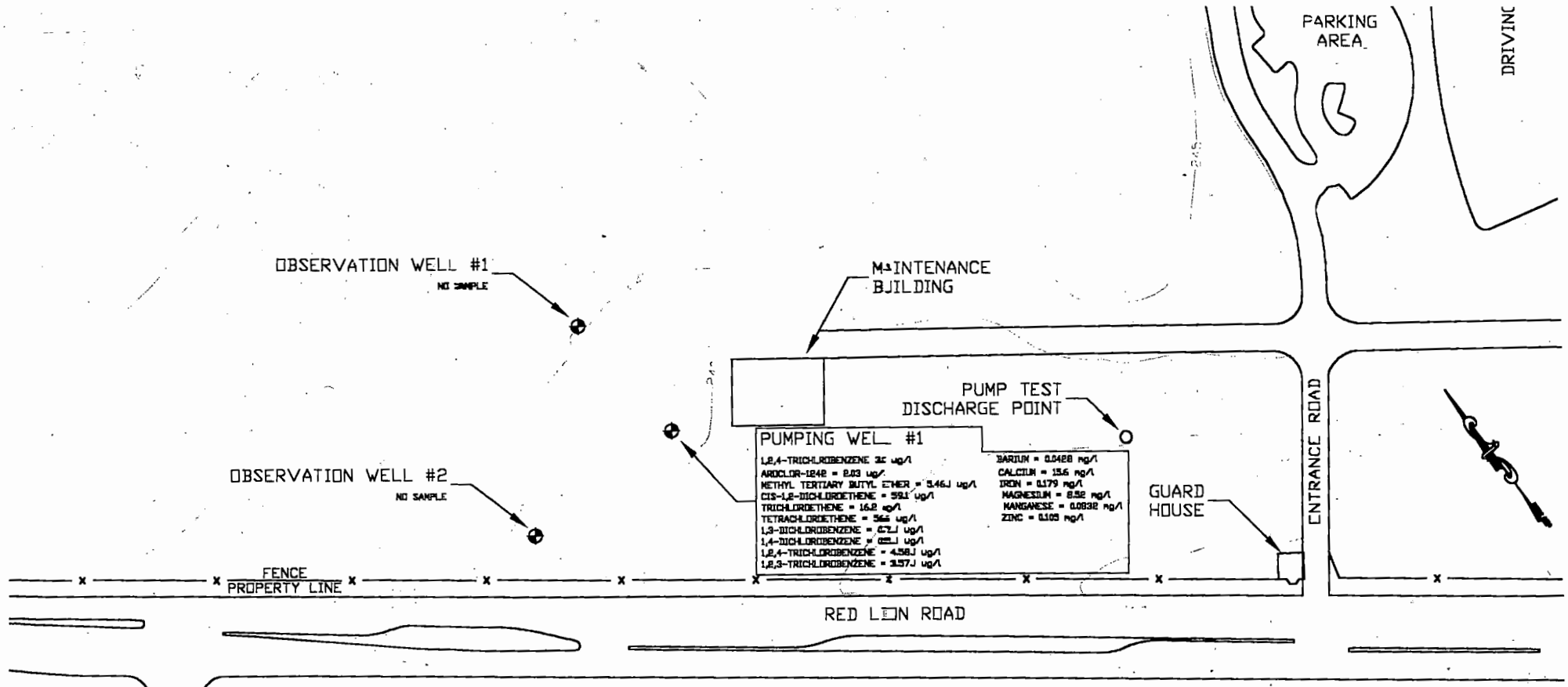
EARTHRES GROUP

EarthRes Group, Inc.
P.O. Box 468
7137 Old Easton Road
Pipersville, PA 18947 USA
www.earthres.com
215-766-1211

DRAWN BY:	CHECKED BY:
AJG	SRC
DATE: 11/25/02	PROJECT NO: 021015.001
DRAWING SCALE: 1" = 100'	

FIGURE 8
SUMMARIZED VOC DETECTIONS
AUGUST 20, 2002

ISLAND GREEN COUNTRY CLUB
1 RED LION ROAD
PHILADELPHIA, PENNSYLVANIA



EGEND

/ELL LOCATION (ANALYTICAL RESULTS)
LOCATIONS ARE APPROXIMATE)

PPROX. COUNTY LINE

OPOGRAPHIC CONTOUR

FROM "GENERAL GOLF COURSE / SITE TOPO PLAN"
COVTON ASSOCIATES, 11/7/00.

ENVIRONMENTAL ENGINEERING and SCIENCE

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11/25/02	021015.001

DRAWING SCALE: 1" = 100'

FIGURE 9

SUMMARIZED LABORATORY ANALYTICAL RESULTS – PW #1 – AUGUST 16, 200

ISLAND GREEN COUNTRY CLUB
1 RED LION ROAD
PHILADELPHIA, PENNSYLVANIA

Pennsylvania Department of Environmental Protection

Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428

May 7, 1998

COPY

Southeast Regional Office

610-832-5
Fax 610-832-6

RECEIVED
MAY 0 8 1998

Mr. Robert S. Hyams, Manager
Environmental Resources
Transit America, Inc.
One Red Lion Road
Philadelphia, PA 19115

Re: ECP - Special Projects - Act 2
ID No. 1-51-0-27116
Transit America, Inc.
City of Philadelphia
Philadelphia County

Dear Mr. Hyams:

The Department of Environmental Protection (DEP) has received the "Notice of Intent to Remediate", proof of public notifications and the following reports submitted in accordance with the Land Recycling and Environmental Remediation Standards Act (Act 2):

1. "Remedial Investigation Report for the Transit America, Inc., Red Lion Road Facility; Document 1, Volume 1", dated March 1998, prepared by Applied Environmental Management, Inc.

2. "Ground Water RI Report for the Transit America, Inc., Red Lion Road Facility; Document 1, Volume 2", dated March 1998, prepared by O'Brien and Gere Engineers, Inc.

3. "Remedial Investigation Report for the Transit America, Inc., Red Lion Road Facility; Document 1, Volume 1A - Appendix; Listing of Environmental Sample Results, PCBs", dated March 1998, prepared by Applied Environmental Management, Inc.

4. "Remedial Investigation Report for the Transit America, Inc., Red Lion Road Facility; Document 1, Volume 1A - Appendix; Listing of Environmental Sample Results, VOCs", dated March 1998, prepared by Applied Environmental Management, Inc.

5. "Remedial Investigation Report for the Transit America, Inc., Red Lion Road Facility; Document 1, Volume 1A - Appendix; Listing of Environmental Sample Results, EP Toxicity, Dioxins, Furans, Wet Chemistry and Herbicides", dated March 1998, prepared by Applied Environmental Management, Inc.